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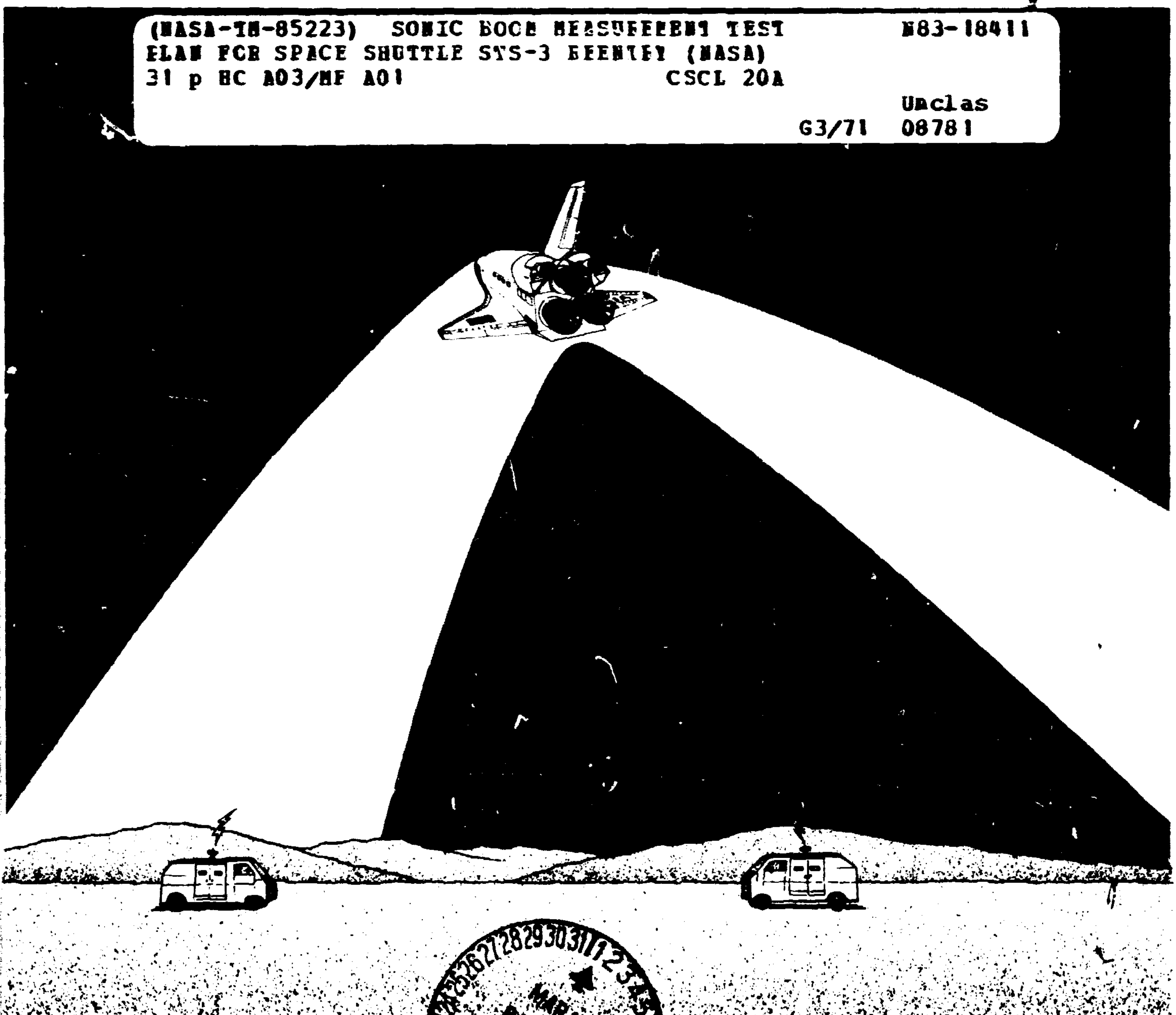
SONIC BOOM MEASUREMENT TEST PLAN
FOR SPACE SHUTTLE STS-3 REENTRY

Prepared by Herbert R. Henderson



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National Aeronautics and Space Administration

APPROVAL AUTHORITY

SONIC BOOM MEASUREMENT TEST PLAN

FOR SPACE SHUTTLE STS-3 REENTRY

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PREFACE

This document relates to an overall plan which describes the Space Shuttle STS-3 Sonic Boom Measurement Program and is supplied as a detail guide and formal documentation for measurement procedures, system specifications, and general information for others involved in the program. By way of review, the Space Shuttle STS-3 will be launched from complex 39A at the Kennedy Space Center, Florida, into a 130 nautical mile circular orbit with a 38 degree inclination. Deorbit should occur to accomplish a landing at a pre-selected, primary, secondary or contingency landing site. The deorbit maneuver is initiated at 170 hours, 28 minutes, 45 seconds, mission elapsed time during the 115th orbit, with subsequent landing on Rogers Lakebed at Edwards Air Force Base, CA. Runway 23 will be the primary runway. Alternate runway 17 at EAFB will be used if the crosswind on runway 17 is between 10 and 15 knots; the use of runway 17 will allow the completion of the crosswind landing test. Nominal end of flight, abort to orbit (ATO), and abort-once-around (AOA) landings will be on Rogers Lakebed, runway 23 at EAFB. In the event of deviations from the normal reentry plan, or other abort landing sites used the subject sonic boom measurement test plan will not provide for the reentry sonic boom measurements.

PURPOSE OF TEST PLAN

This test plan is designed to provide information, guidance, and assignment of responsibilities for the acquisition of sonic boom and atmospheric measurements, timing correlation, communications and other necessary supporting tasks. Specifically included are details such as mobile data acquisition station locations, measurement systems calibration levels, predicted sonic boom overpressure levels, overpressure level assignment for each data acquisition station, data recording times on and off, universal coordinated time, and measurement system descriptions.

INTRODUCTION

A series of sonic boom ground measurements associated with the reentry of STS-1 and 2 were successfully accomplished in April and November 1982 respectively. The STS-1 measurements were acquired at 11 positions located along the ground flight track from over the pacific cost line to landing and at various lateral conditions using a total of 45 microphones. STS-2 measurements were acquired at four positions which were concentrated under the reentry flight track approximately three nautical miles apart. Details of the STS-1 and 2 test plans are given in references 1 and 2.

The puspose of these measurements was to permit an evaluation of the accuracy of the sonic boom theory, based upon aircraft, Apollo, and Skylab measurements as applied to the Space Shuttle's configuration and operational parameters. Additional objectives of the sonic boom measurement program is to obtain a minimum amount of flight data which used in conjunction with analytical techniques will result in the definition of the orbiter acoustic impact on populated regions during reentry and will fulfill the commitment made in the Space Shuttle Environmental Impact Statement to validate preflight prediction technology.

Detail analysis of the STS-1 sonic boom data is available in a NASA Technical Memorandum and the STS-2 data is currently underway and comparisons with predictions are forthcoming. Initial examination of these measured data was as expected in terms of signature shape, overpressure levels, and the area in which the higher overpressures would be experienced. However, additional measurements are needed in the later region to better define highest sonic boom overpressures generated.

The purpose of the present measurement program is to provide flight data to determine the lateral area from the reentry ground track affected by sonic boom overpressure levels. Ground measurement positions will be concentrated in an area generally north and south of Bakersfield, California approximately 65 nautical miles from touchdown.

MEASUREMENT PLAN

General Scope

This measurement plan consists of deploying four data acquisition stations which will be mobile units (vans) laterally to the STS-3 reentry flight track into the Edwards Air Force Base area (see figure 1). These stations (see tables 1 and 2 respectively for theoretical predictions and approximate station locations) will provide six intermediate band FM channels of Sonic Boom Data, universal time synchronization and voice annotation. They will also be supported with atmospheric measurements (rawinsonde system at station No. 3) along with meteorological data obtained from U.S. Air Force at Edwards Air Force Base, CA. All measurements will be correlated with the vehicle reentry flight track information along with atmospheric and vehicle operation conditions. Program responsibilities are also identified (see figure 2).

Procedures

Stations 1 - 4

a. Each day a fresh tape will be used for precals, annotated according to procedures. If reentry occurs this day the precal tape will also be used for post cals. After precals a fresh tape will be loaded for reentry data. This tape will be annotated only when "recorders on" command is given. If reentry does not occur this tape will be used for the next days precals.

b. Two hour warm-up all instrumentation.

c. All sonic boom and meteorological measurement related activities will operate through the sonic boom coordinator console position located in building 4800 at Dryden Flight Research Facility.

d. The meteorological team will release three radiosondes.

   1st release at launch.

   2nd release at touchdown minus 90 minutes.

   3rd release at touchdown minus 30 minutes.

e. Voice communications between all measurement stations and the sonic boom coordinator console will utilize commercial dedicated telephone lines.

f. Utilization of communication circuits will be held to a minimum. There will be no communication between measurement stations unless your station is called. If an instrumentation failure exists, call sonic boom coordinator and the appropriate personnel will be notified.

g. All tape recorder data channels will be calibrated at both pre and post flight situations using a precision one volt RMS source to verify center frequency stability.

h. All microphones will be calibrated at pre and post flight conditions using 130dB sound pressure level at a fixed frequency of one kHz.

i. All information pertaining to calibrations, overpressure levels, and amplifier gains will be recorded on the assigned voice annotation channel.

j. While recording data, including all calibrations, Greenwich Mean Time (GMT) will be recorded on the assigned timing channel.

k. Sonic Boom Coordinator will give "recorders on" and "recorders off" command for all sonic boom measurement stations during STS-3 reentry. However, a time delay is anticipated from the recorders on command to boom arrival.

l. All pertinent data will be recorded on data sheets; i.e., microphone number, tape channel number, calibration levels, weather conditions, aircraft in vicinity of station while calibrating instrumentation, etc.

m. Stations experiencing any problems affecting this sonic boom measurement program will notify Sonic Boom Coordinator as soon as possible.

n. There will be no radio frequency transmission during data recording.

Atmospheric Measurements

Past experience gained on aircraft, Apollo, Skylab, and Shuttle Sonic Boom Measurement Programs have shown that it is necessary to have atmospheric information

since temperature and wind gradients and low level turbulence can significantly affect the sonic boom ground exposure patterns.

Therefore atmospheric data at the surface and aloft will be obtained by using the rawinsonde technique. Rawinsonde observations will be taken at launch, and at 30 minutes and 90 minutes before STS-3 touchdown to establish the temperature, pressure and wind characteristics of the atmosphere to altitudes of up to 30 km. Rawinsonde systems furnished and operated by personnel from the Atmospheric Science Division at the Marshall Space Flight Center will be located at one sonic boom measurement site (No. 3) which will be positioned laterally to the STS-3 reentry track.

RAWINSONDE - The RAWIN System is a transportable radio direction finder. It is designed to track a balloon-borne radiosonde automatically. A radiosonde signal containing meteorological information in the form of amplitude or frequency modulation is received, amplified and detected by this system. The detected signal is passed to separate equipment in the system where it is recorded. By reference to calibration data for the radiosonde, this recorded information is converted to values of temperature, humidity, and pressure. Recording of time versus progressive changes of the elevation and azimuth positions of the ascending balloon package, as determined by tracking of the signal from the radiosonde, are made so that they can be later converted to wind speed and direction.

The radiosonde consists of a transmitter, modulator, antenna, battery, and pressure, temperature, and humidity sensing elements. The radiosonde, parachute and train weighs about four pounds and can be carried to an altitude of about 30 km by a helium-filled balloon.

The battery furnishes power to the modulator and transmitter. The transmitter operates in the 1660 - 1700 megahertz (mHz) band and its carrier is amplitude modulated by an audiofrequency pulse, the rate of which is determined by the pressure, temperature and humidity sensing elements.

The RAWIN set automatically tracks the balloon-borne radiosondc by continuous homing on the radiosonde signal to horizontal distances of about 125 miles and altitudes of up to 30 km. The equipment recorder records the azimuth and elevation angles of the position of the radiosonde versus time.

Time Synchronization

In order to fully benefit from ground sonic boom measurements precision time synchronization is necessary. Specifically a real-time track (range time) is necessary for later data interpretation processes (ray tracing, and shock wave arrival times, etc.) which require that the time, atmospheric conditions, vehicle operating conditions and the STS-3 reentry flight track information be known relative to the time the sonic boom was received at a particular measuring station. Therefore the following time synchronization concept will be utilizied.

Precise time synchronization between 4 Sonic Boom data acquisition Stations and the STS-3 reentry trajectory will be obtained from the "GOES" satellites, (Geostationary Operational Environmental Satellite). These satellites belong to the National Oceanic and Atmospheric Administration, which calls for the positioning of one satellite of approximately 135 degrees west longitude, another at 75 degrees west longitude, and a third to be an in-orbit spare. These satellites are in orbit 36,000 kilometers above the equator, they travel at about 11,000 kilometers per hour and remain continuously above the same spot on earth, they are thus termed geostationary. Since they always have the same regions of earth in view, they can provide 24 hour, continuous service.

The sonic boom measuring stations are equipped with satellite synchronized time code clocks which have been designed to receive and decode timing information from the NOAA "GOES" satellite which transmits on a frequency of 468 mHz, the displayed time as well as the electrically outputed time will be Universal Coordinated Time (UCT), more commonly referred to as Greenwich Mean Time (GMT). This

time base will be recorded on magnetic tape using an IRIG-B format of day-of-year, hours, minutes, and seconds to an accuracy of ±1.0 milli second traceable to the National Bureau of Standards.

Communications

A voice circuit (dedicated hard line communication link) will be available from the space radiation analysis group (srag) console No. 386 in mission control located at the Johnson Space Center to the Sonic Boom Coordinator Console position located in building 4800 at the Dryden Flight Research Facility in order that the program principal investigator may respond to possible STS-3 reentry profile anomalies.

Primary voice communications between Dryden Flight Research Facility and four sonic boom and one meteorological measurement stations will utilize commercial telephone lines. All sonic boom related communications traffic will operate through the Sonic Boom Coordinator console position located in building 4800 at Dryden Flight Research Facility.

General Flight Plan

The STS-3 will be a 171.3 hour flight launched from the Kennedy Space Center on March 22, 1982, at 15:00 Greenwich Mean Time (GMT). The flight test will be achieved in a 130 nautical mile circular orbit with a 38 degree inclination. The nominal deorbit maneuver is thrust initiated at 170 hours 28 minutes and 45 seconds mission elapsed time during the 115th orbit, with entry interface occuring at 400,000 feet altitude with subsequent landing on Rogers Lakebed runway 23 at Edwards Air Force Base, CA at 10:22 a.m. Pacific Standard Time (PST). A backup deorbit opportunity occurs during the 116th orbit. There will be landing opportunities at EAFB each day: six orbits per day for 6 days, five orbits per day for 1 day and three orbits for the final day of the mission. No landing (nominal, abort, or contingency) will be earlier than 15 minutes prior to sunrise nor later than sunset plus 15 minutes. The above information obtained from reference 3.

Sonic Boom Measurement System

Proven aircraft and large spacecraft sonic boom data acquisition systems are to be utilized for ground level sonic boom measurements during STS-3 reentry. These systems have been used in previous aircraft, Apollo, Skylab, and Shuttle sonic boom programs and consist of pressure transducers, Dynagages (oscillator-detector circuit), instrumentation amplifiers, FM magnetic tape recorders, and satellite time code receivers. Specifically, the pressure transducer is a commercially available condenser microphone with a high frequency response to 10 kHz when used with the model DG-605 Dynagage system, with the low end frequency response of approximately -5 dB at -.01 Hz. The low end frequency response is made possible by modifying the configuration of the chamber vent behind the microphone diaphram. Basically, the size of the vent was diminished thereby reducing the atmospheric pressure bleed rate. This procedure will allow adequate provisions for system balancing, temperature and, atmospheric pressure changes during field operations.

The Dynagage consists of a radio frequency oscillator coupled to a diode detector circuit whereby small changes in capacity of the pressure transducer will produce relatively large changes in the diode detector. The output of the detector is therefore proportional to the pressure applied to the tranducer diaphram. The Dynagage output is fed into an instrumentation amplifier which provides a gain of 0 to 60 dB in steps of 2 dB with a flat frequency response of D.C. to 20 kHz.

The measurement system will utilize frequency modulated magnetic tape recorders operating at 30 ips in the intermediate band with a frequency response of D.C. to 10 kHz. Commercial AC power will be obtainable at some of the data acquisition sites, with the remaining sites utilizing portable gasoline generators. This instrumentation will be mounted in commercially available vehicles (vans). Each measuring station will utilize four microphones, three of which will be co-located in 4 x 4 ft ground board (necessary to obtain true ground pressures with the incident and

reflected waves exactly in phase). The fourth microphone is mounted at ear level. The data from the three ground level microphones will provide information for direct comparison with predicted sonic boom overpressure levels based on measured wind tunnel data along with measured overpressure data obtained during STS-1 and STS-2 reentry. This data identified areas where the highest overpressure levels were predicted to occur during the orbiter reentry. The data obtained from the STS-3 reentry will better identify the lateral overpressure distribution area. The fourth microphone positioned at ear level height at the request of the Marshall Space Flight Center investigator, will provide information of the subjective aspects of sonic booms relative to current standard measurements for aircraft flyover noise.

All microphones will be covered with wind screens consisting of two layers of cheesecloth which will minimize effects of surface winds on the microphone readings and also to provide shade from the sun and protection from blowing sand particles. The output of the microphones will be routed through the instrumentation amplifiers thus allowing for the setting of a range of overpressure levels a precaution necessary to allow for discrepancies in the predictive method for sonic boom theory (it is not verified at this time if the predictive method really applies to blunt bodies at high angle of attack) or anomalous overpressures caused by unusual atmospheric or focusing conditions. Each station will record 6 channels of overpressure data, time code signal, and voice annotation.

A complete scan through all data channels is repeated at regular intervals while the data acquisition station is operational. As the orbiter passes over the coast of California on a descending track to a landing the scanning of all data channels will be continuous until the orbiter is well past the measurement position and data acquisition is terminated. All tape recorder data channels will be calibrated using a precision voltage source to verify center frequency stability. Laboratory calibration of the microphone systems to determine frequency response is performed at regular intervals, utilizing an infrasonic pistonphone technique. In

the field the microphones will be calibrated using an acoustical calibrator which generates a known sound pressure level in a closed cavity at a fixed frequency of 1 KHz. Calibrations will be performed at both "pre" and "post" flight conditions and will eatablish the amplitude sensitivity of the system which will verify an end-to-end acoustical calibration.

EVENT TIMES

STATION - 1

DAY 1 (LAUNCH)

Arrive at measurement station at launch time minus 3 hours.
Ready to record data, 1 hours, 15 min after launch.

DAY 2

Arrive at measurement station, 23 hours, 33 min after launch.
Ready to record data 1 day plus, 2 hours, 03 min after launch.

Day 3

Arrive at measurement station, 46 hours, 20 min after launch.
Ready to record data 2 days plus, 0 hours, 50 min after launch.

Day 4

Arrive at measurement station, 70 hours, 06 min after launch.
Ready to record data 3 days plus, 0 hours, 36 min after launch.

Day 5

Arrive at measurement station, 92 hours, 28 min after launch.
Ready to record data 3 days plus, 23 hours, 48 min after launch.

Day 6

Arrive at measurement station, 118 hours, 06 min after launch.
Ready to record data 4 days plus, 22 hours, 36 min after launch.

Day 7

Arrive at measurement station, 139 hours, 54 min after launch.
Ready to record data 5 days plus, 22 hours, 14 min after launch.

Day 8

Arrive at measurement station, 163 hours, 40 min after launch.
Ready to record data 6 days plus, 22 hours, 10 min after launch.

- "Recorders On" command will be given by Sonic Boom Coordinator.
- Sonic Boom Coordinator will advise station release time for each day.

Pressure Level Assignment

STATION - 1

PREDICTED OVERPRESSURE LEVEL 1.24 PSF

MICROPHONE	PRESSURE LEVEL		TAPE CHANNEL
19	1.24 PSF / 126 dB	PRIMARY	1
19	2.34 PSF / 132 dB		2
20	.59 PSF / 120 dB		3
20	.59 PSF / 120 dB		4
21	1.24 PSF / 126 dB	EAR LEVEL	5
22	2.34 PSF / 132 dB		6
IRIG - B TIME CODE			7

VOICE ANNOTATION EDGE TRACK RECORDED

CALIBRATION AND OVERPRESSURE LEVEL SETTINGS

CONSOLE 5 DATE ____________

STATION 1 OPERATOR ____________

SYSTEM NUMBER	D.G TUNES	CAL. SETTINGS D.G ATTN. SETTING	CAL. SETTINGS B.B. AMP. SETTING	ASSIGNED RUN LEVELS	RUN SETTINGS D.G ATTN. SETTING	RUN SETTINGS B.B. AMP. SETTING	TAPE CH
19	3.4 at 52	21	1 6	126 dB	24	1 6	1
			2 6	132 dB		2 0	2
20	3.2 at 45	18	3 4	120 dB	15	3 6	3
			4 4	120 dB		4 6	4
21	3.2 at 44	18	5 2	126 dB	21	5 4	5
22	4.0 at 44	15		132 dB	24		6

Cal. Level 130 dB, set system gain for 2 vpp input to tape recorder.

NOTE: D.G attn. setting must satisfy 2 B.B. amp settings where applicable.
Avoid setting D.G attn. below 6 dB if possible.

EVENT TIMES

STATION - 2

DAY 1 (LAUNCH)

Arrive at measurement station at launch time minus 3 hours
Ready to record data,12 hours, 15 min after launch.

DAY 2

Arrive at measurement station, 23 hours, 33 min after launch.
Ready to record data 1 day plus, 2 hour, 03 min after launch.

Day 3

Arrive at measurement station, 46 hours, 20 min after launch.
Ready to record data 2 days plus, 0 hours, 50 min after launch.

Day 4

Arrive at measurement station, 70 hours, 06 min after launch.
Ready to record data 3 days plus, 0 hours, 36 min after launch.

Day 5

Arrive at measurement station, 92 hours, 18 min after launch.
Ready to record data 3 days plus, 23 hours, 48 min after launch.

Day 6

Arrive at measurement station, 118 hours, 06 min after launch.
Ready to record data 4 days plus, 22 hours, 36 min after launch.

Day 7

Arrive at measurement station, 139 hours, 54 min after launch.
Ready to record data 5 days plus, 22 hours, 14 min after launch.

Day 8

Arrive at measurement station, 163 hours, 40 min after launch.
Ready to record data 6 days plus, 22 hours, 10 min after launch.

- "Recorders On" command will be given by Sonic Boom Coordinator.
- Sonic Boom Coordinator will advise station release time for each day.

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Pressure Level Assignment

STATION - 2

PREDICTED OVERPRESSURE LEVEL .85 PSF

MICROPHONE	PRESSURE LEVEL		TAPE CHANNEL
7	.85 PSF / 123 dB	PRIMARY	1
	1.66 PSF / 129 dB		2
8	.42 PSF / 117 dB		3
	.42 PSF / 117 dB		4
9	.85 PSF / 123 dB	EAR LEVEL	5
10	1.66 PSF / 129 dB		6
IRIG - B TIME CODE			7

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CALIBRATION AND OVERPRESSURE LEVEL SETTINGS

CONSOLE 2 DATE ____________

STATION 2 OPERATOR ____________

SYSTEM NUMBER	D.G TUNES	CAL. SETTINGS D.G ATTN. SETTING	CAL. SETTINGS B.B. AMP. SETTING	ASSIGNED RUN LEVELS	RUN SETTINGS D.G ATTN. SETTING	RUN SETTINGS B.B. AMP. SETTING	TAPE CH
7	3.2 at 44	21	1 6	123 dB	24	1 8	1
			2 6	129 dB		2 2	2
8	4.2 at 51	18	3 4	117 dB	15	3 6	3
			4 4	117 dB		4 6	4
9	3.3 at 47	21	5 6	123 dB	24	5 8	5
10	4.2 at 47	15		129 dB	24		6

Cal. Level 130 dB, set system gain for 2 vpp input to tape recorder.

NOTE: D.G attn. setting must satisfy 2 B.B. amp settings where applicable.
Avoid setting D.G attn. below 6 dB if possible.

EVENT TIMES

STATION - 3

DAY 1 (LAUNCH)

Arrive at measurement station at launch time minus 3 hours.
Ready to record data, 1 hour, 15 min after launch.

DAY 2

Arrive at measurement station, 23 hours, 33 min after launch.
Ready to record data 1 day plus, 2 hours, 03 min after launch.

Day 3

Arrive at measurement station, 46 hours, 20 min after launch.
Ready to record data 2 days plus, 0 hours, 50 min after launch.

Day 4

Arrive at measurement station, 70 hours, 06 min after launch.
Ready to record data 3 days plus, 0 hours, 36 min after launch.

Day 5

Arrive at measurement station, 92 hours, 18 min after launch.
Ready to record data 3 days plus, 23 hours, 48 min after launch.

Day 6

Arrive at measurement station, 118 hours, 06 min after launch.
Ready to record data 4 days plus, 22 hours, 36 min after launch.

Day 7

Arrive at measurement station, 139 hours, 54 min after launch.
Ready to record data 5 days plus, 22 hours, 14 min after launch.

Day 8

Arrive at measurement station, 163 hours, 40 min after launch.
Ready to record data 6 days plus, 22 hours, 10 min after launch.

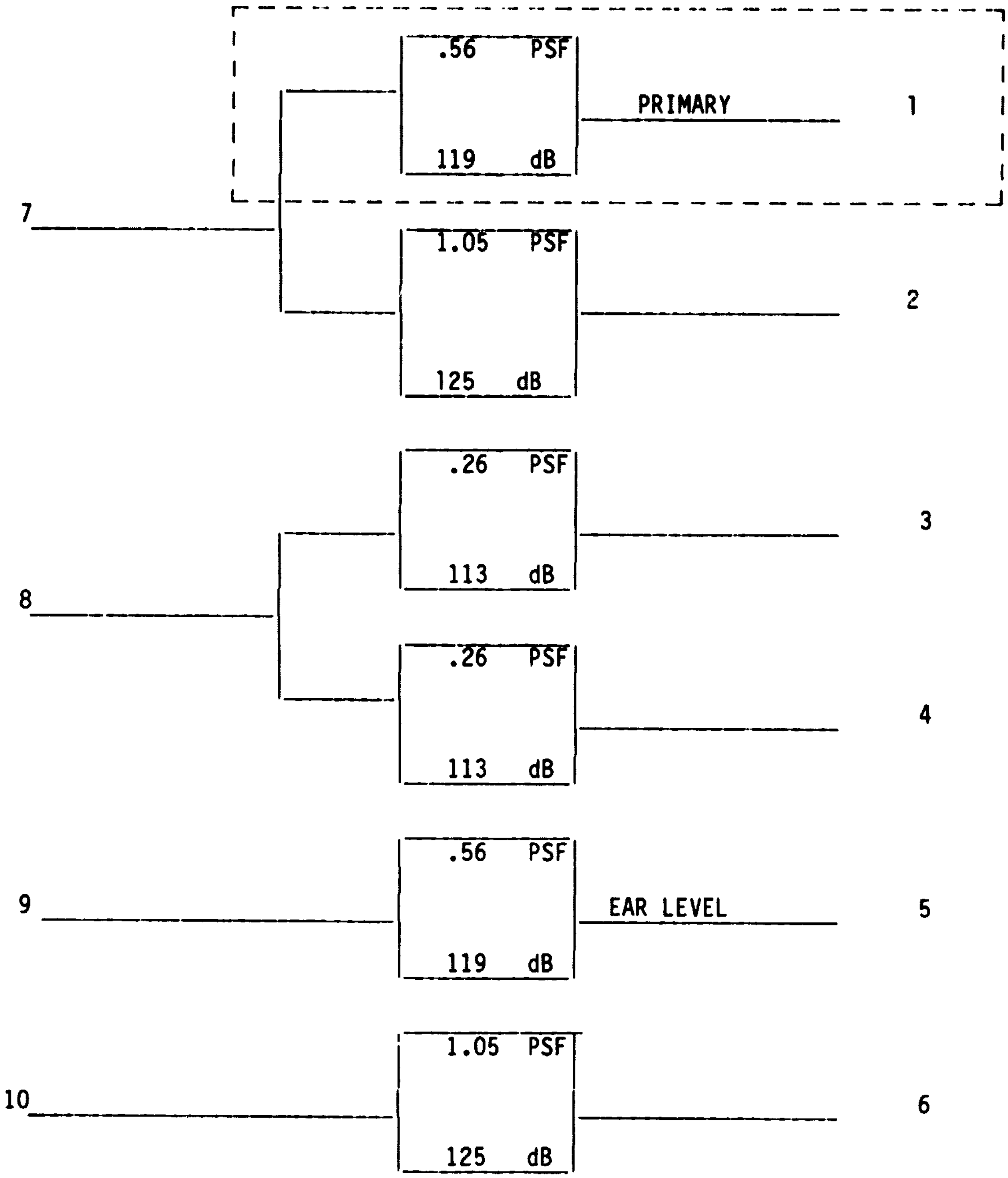
- "Recorders On" command will be given by Sonic Boom Coordinator.
- Sonic Boom Coordinator will advise station release time for each day.

Pressure Level Assignment

STATION - 3

PREDICTED OVERPRESSURE LEVEL .56 PSF

MICROPHONE | PRESSURE LEVEL | TAPE CHANNEL



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VOICE ANNOTATION EDGE TRACK RECORDED

CALIBRATION AND OVERPRESSURE LEVEL SETTINGS

CONSOLE 3 DATE ________

STATION 3 OPERATOR ________

SYSTEM NUMBER	D.G TUNES	CAL. SETTINGS: D.G ATTN. SETTING	CAL. SETTINGS: B.B. AMP. SETTING	ASSIGNED RUN LEVELS	RUN SETTINGS: D.G ATTN. SETTING	RUN SETTINGS: B.B. AMP. SETTING	TAPE CH
11	4.0 at 51	21	1 6	119 dB	24	1 8	1
			2 6	125 dB		2 2	2
12	4.2 at 50	21	3 6	113 dB	18	3 8	3
			4 6	113 dB		4 8	4
13	3.3 at 51	21	5 8	119 dB	24	5 10	5
14	4.4 at 52	15		125 dB	24		6

Cal. Level 130 dB, set system gain for 2 vpp input to tape recorder.

NOTE: D.G attn. setting must satisfy 2 B.B. amp settings where applicable. Avoid setting D.G attn. below 6 dB if possible.

EVENT TIMES

STATION - 4

DAY 1 (LAUNCH)

Arrive at measurement station at launch time minus 3 hours.
Ready to record data, 1 hours, 15 min after launch.

DAY 2

Arrive at measurement station, 23 hours, 33 min after launch.
Ready to record data 1 day plus, 2 hour, 03 min after launch.

Day 3

Arrive at measurement station, 46 hours, 20 min after launch.
Ready to record data 2 days plus, 0 hours, 50 min after launch.

Day 4

Arrive at measurement station, 70 hours, 06 min after launch.
Ready to record data 3 days plus, 0 hours, 36 min after launch.

Day 5

Arrive at measurement station, 92 hours, 18 min after launch.
Ready to record data 3 days plus, 23 hours, 48 min after launch.

Day 6

Arrive at measurement station, 118 hours, 06 min after launch.
Ready to record data 4 days plus, 22 hours, 36 min after launch.

Day 7

Arrive at measurement station, 139 hours, 54 min after launch.
Ready to record data 5 days plus, 22 hours, 14 min after launch.

Day 8

Arrive at measurement station, 163 hours, 40 min after launch.
Ready to record data 6 days plus, 22 hours, 10 min after launch.

- "Recorders On" command will be given by Sonic Boom Coordinator.
- Sonic Boom Coordinator will advise station release time for each day.

Pressure Level Assignment

STATION - 4

PREDICTED OVERPRESSURE LEVEL .46 PSF

MICROPHONE	PRESSURE LEVEL		TAPE CHANNEL
15	.46 PSF / 118 dB	PRIMARY	1
15	.93 PSF / 124 dB		2
16	.23 PSF / 112 dB		3
16	.23 PSF / 112 dB		4
17	.46 PSF / 118 dB	EAR LEVEL	5
18	.93 PSF / 124 dB		6
IRIG - B TIME CODE			7

VOICE ANNOTATION EDGE TRACK RECORDED

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CALIBRATION AND OVERPRESSURE LEVEL SETTINGS

CONSOLE 4 DATE ______

STATION 4 OPERATOR ______

SYSTEM NUMBER	D.G TUNES	CAL. SETTINGS: D.G ATTN. SETTING	CAL. SETTINGS: B.B. AMP. SETTING	ASSIGNED RUN LEVELS	RUN SETTINGS: D.G ATTN. SETTING	RUN SETTINGS: B.B. AMP. SETTING	TAPE CH
15	4.0 at 51	21	1 4	118 dB	24	1 6	1
			2 4	124 dB		2 0	2
16	4.0 at 52	18	3 2	112 dB	15	3 4	3
			4 2	112 dB		4 4	4
17	4.4 at 45	18	5 2	118 dB	21	5 4	5
18	3.1 at 47	15		124 dB	24		6

Cal. Level 130 dB, set system gain for 2 vpp input to tape recorder.

NOTE: D.G attn. setting must satisfy 2 B.B. amp settings where applicable. Avoid setting D.G attn. below 6 dB if possible.

Table 1.- The STS-3 Sonic Boom Theoretical Predictions for Bakersfield, California Area.

STATION NUMBER	FLIGHT MACH NUMBER	FLIGHT ALTITUDE, (ft)	Δp (PSF)	LATERAL DISTANCE FROM GROUND TRACK (n mi)	LONGITUDE, DEG, W	LATITUDE, DEG, N
1	3.5	98,800	1.24	9 south	119.003	34.881
2	3.5	98,800	.84	7 north	118.932	35.123
3	3.5	98,800	.56	23 north	118.762	35.426
4	3.5	98,800	.46	38 north	118.661	35.584

Table 2.- Approximate Positioning Information for STS-3 Sonic Boom Measuring Stations for Bakersfield, CA Area.

STATION, NO/NAME	* LONGITUDE, DEG, w	* LATITUDE, DEG, N
1 Frazier Park	119.033	34.832
2 Wheeler Ridge	118.963	35.082
3 Tower Line Road	118.808	35.35
4 French Ranch	118.680	35.583

* Approximate positioning information obtained from 7.5 minute series topographic maps.

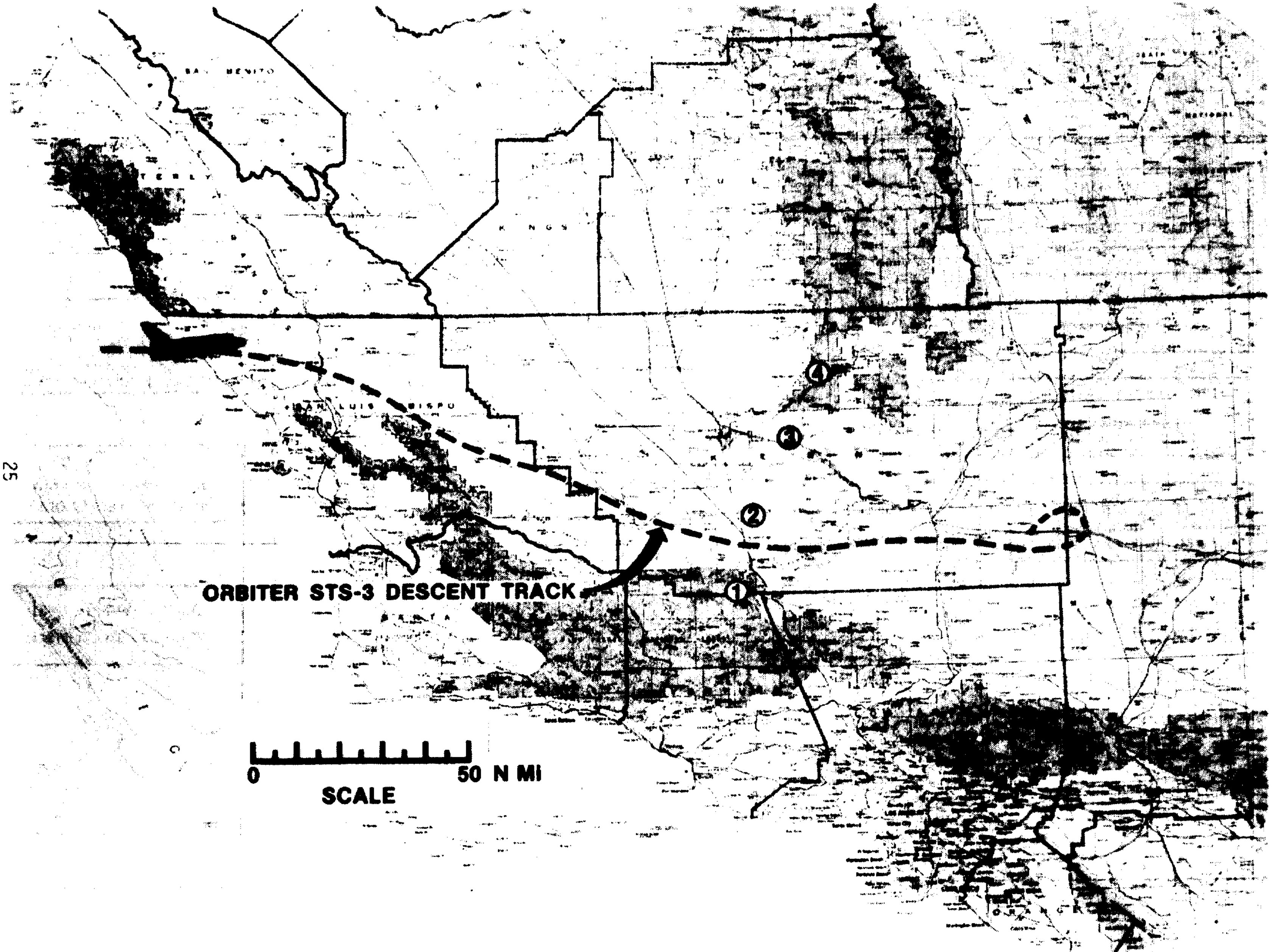

Figure 1. - Shows the location of four sonic boom ground measuring sites located laterally to the STS-3 reentry track into Edwards Air Force Base, California.

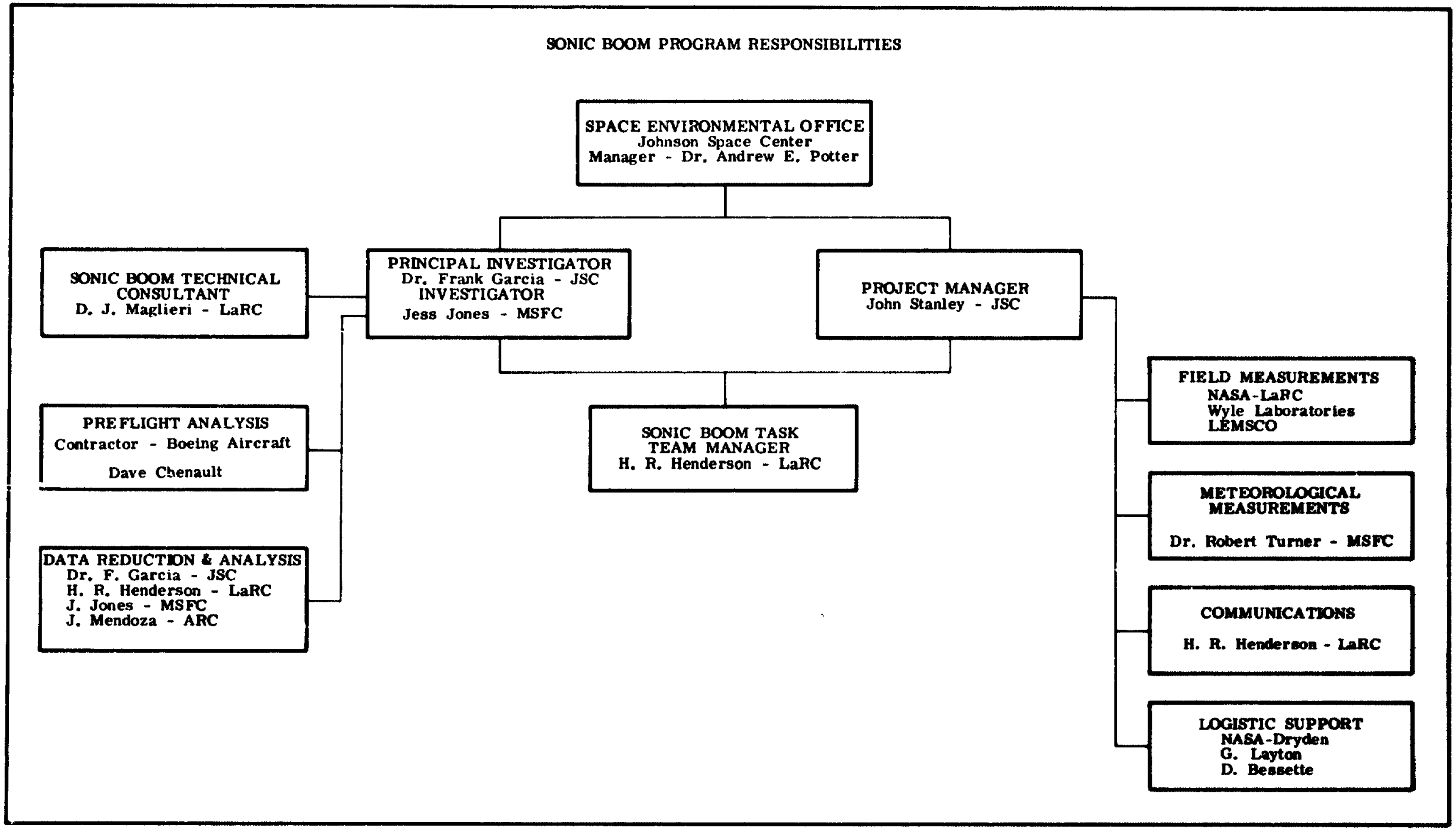

Figure 2. - Program responsibilities.

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3. STS-3 Operational Flight Profile; Volume 11, Profile Summary Cycle 2. Space Shuttle Program Office, Lyndon B. Johnson Space Center, Houston, TX, January 1982.